NASA Procedural Requirements

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Appendix H. Reviews

This Appendix provides information to guide compliance with requirements for Independent and Project Milestone Reviews.

Guiding Principles of Reviews:

- Reviews are a resource. They offer an opportunity to add value to the products and to the sharing of knowledge by inviting outside experts that can provide confirmation of the approach and/or recommend options.
- Reviews are a tool for communication. They offer an opportunity to organize, assess, and communicate critical data and information between providers, customers, and stakeholders.

H.1 Independent Reviews

This section provides information to guide compliance with the requirements for independent reviews and assessments contained in Section 2.5 for programs, in Section 3.5 for common projects and in Section 6.5 for flight projects. For applicability of these reviews to the various Product Lines, refer to Table 2-1 Program Decision Reviews.

H.1.1 Major Reviews

The objectives and salient features of the eight major independent review types are provided to guide program/project managers in the formulation and implementation of programs and projects. Reviews provide the opportunity to confirm the approach or offer options, if needed, and communicate progress and risks toward meeting the success criteria. These reviews also evaluate and communicate the level of safety and likelihood of mission success.

Reviews also serve the needs of the various levels of the management hierarchy from an individual product lead on a project to the NASA Administrator. The output of these reviews (i.e., assessments, options, findings, recommendations, and decisions) flows as inputs into subsequent reviews as appropriate to ensure alignment between providers, customers, and stakeholders, and ensure proper disposition of issues. It is the responsibility of the Program or Project Manager to propose options to combine reviews to providers, customers, and stakeholders, provided that the objectives of each are met. The goal is to maximize the probability of mission success through added value and efficiencies.

Independent reviews are conducted by independent panels composed of management, technical, and budget experts from organizations outside of the advocacy chain of the program/project being reviewed. To the extent possible, continuity of review panel membership is maintained from review to review and throughout the life cycle of a project.

The Program Manager negotiates with Mission Directorate and GPMC officials to optimize the value of independent reviews for a program/project. The agreement for independent reviews for each program is documented in the FAD, PCA, and Program Plan. The Program Manager flows down the agreed requirement for independent reviews, as appropriate, to the projects within the program. Independent reviews planned during the project life cycle are documented in the FAD (or equivalent) and in the Project Plan.

H.1.1.2 Concept Decision Review

A Concept Decision Review (CoDR) is an independent review conducted on both proposed programs and projects that use the evolutionary development approach. It provides Agency management with an independent assessment of the readiness of the program and project proceed into formulation (pre-Phase A to Phase A). Review criteria include assessment of the program's or project's alignment with NASA's strategic goals and the thoroughness of the planning for formulation. The CoDR is not applicable to programs and projects that use a traditional development approach.

H.1.1.3 Preliminary Non-Advocate Review

A Preliminary Non-Advocate Review (Pre-NAR) is an independent review of programs and projects conducted at the end of Phase A. It provides Agency management with an independent assessment of the readiness of the program or project to proceed into Phase B and an early assessment of preparations for implementation. Review criteria include assessment of the program's or project's concept, programmatic and technical plans for execution and draft implementation documentation.

H.1.1.4 Non-Advocate Review

A Non-Advocate Review (NAR) is an independent review process of programs and projects conducted at the end of formulation (Phase B). It provides Agency management with an independent assessment of the readiness of the program or project to proceed into implementation (Phase C). Upon successful completion of this review process, a recommended program or project baseline is established. Review criteria include assessment of the program's or project's preliminary design, plans for implementation and final implementation documentation.

H.1.1.5 Production Review

A Production Review (PR) is the independent review of an approved evolutionary project's programmatic and technical readiness to proceed with flight hardware production. It provides Agency management with an independent assessment of the readiness of the project to proceed into Phase D of implementation. Review criteria include assessment of the project's continued consistency with NAR Baseline commitments (performance, safety, cost, risk, and schedule) and adequacy of engineering hardware design, development, and test results. The PR is not applicable to programs and projects that use a traditional development approach.

H.1.1.6 Program Implementation Review

Program Implementation Reviews (PIR) are conducted by the IPAO after the NAR approval and assesses the program's continued consistency with NAR Baseline commitments (performance, safety, cost, risk, and schedule) and strategic alignment, as defined in a PCA, Program Plan, and/or Project Plans. The results of this review are reported to the Agency PMC. PIRs are nominally scheduled at two-year intervals during implementation.

H.1.1.7 Program and Project Safety and Mission Readiness Review

A Program Safety and Mission Readiness Review (SMARR) is a NASA Headquarters Safety and Mission Assurance review that is held for Chief Safety and Mission Assurance (SMA) Officer to independently assess, from an SMA perspective the readiness of selected mission event/milestones (e.g. launches and high risk tests). This assessment is designed to:

1. Affirm that assurance processes have been implemented over the life of the program or project and verify compliance with the applicable baseline requirements set.
2. Identify and evaluate the SMA residual risks for the program or project milestone.

All programs and projects shall provide support for Safety and Mission Assurance Readiness Review. This review is generally conducted concurrently with another program or project review occurring in the same timeframe. H.1.1.8 Office of Safety and Mission Assurance Program Audit and Review

The OSMA Program Audit and Review (PA&R) process is a series of reviews conducted by independent review teams throughout the program and project life cycle. These reviews are conducted to verify program or project

compliance with Agency assurance process requirements and technical requirements by concentrating on flow-down in earlier phases and verification in later program and project phases. The process is designed to take full advantage of information gained in earlier phases, as well as other internal and external audits and reviews. All programs and projects shall provide support for OSMA PA&Rs. This review is generally conducted concurrently with another program or project review in the same timeframe.

H.1.1.9 Other Independent Technical Reviews and Assessments

Other Independent Technical Reviews and Assessments refer to reviews and assessments conducted by NESC and Center safety organizations, as authorized by NASA management, to evaluate technical and safety aspects of the projects. These assessments may include independent testing and analyses.

H.1.2 Assessment Criteria

Assessment criteria serve as a quality check of the engineering and management efforts.

Criteria	CoDR	Pre-NAR	NAR	PR	PIR
Alignment with and contributing to Agency vision and strategic goals	Demonstrate	Demonstrate	Demonstrate		Demonstrate
Adequacy / Availability of resources	Demonstrate	Demonstrate	Demonstrate	Execution	Execution
Adequacy of budget and budget management planning	Demonstrate	Demonstrate	Demonstrate	Execution	Execution
Adequacy of schedule and schedule management planning	Demonstrate	Demonstrate	Demonstrate	Execution	Execution
Adequacy of the technical approach and technical management planning	Demonstrate	Demonstrate	Demonstrate	Execution	Execution
Adequacy of the risk identification, mitigation and management planning	Demonstrate	Demonstrate	Demonstrate	Execution	Execution

Table H-1 Assessment Criteria

Note for Table H-1: Demonstrate is to show planning and tools are in place. Execution is to show results that plans are being effectively carried out.

H.1.3 Review Schedules

The following are typical schedules based on historical precedent and are provided for initial planning purposes. Table H-2 is for programs; Table H-3 is for common projects; and Table H-4 is for flight systems and ground support projects. The specific review schedule is negotiated between the independent review organization and the Mission Directorate (or Mission Support Office) point-of-contact in coordination with the Program or Project Manager, as appropriate. The agreed-upon schedule is documented In the Terms of Reference (ToR).

Program Event	*Initiate IA activities*	*Data Submittal*	*Site Field Review*	*Conclude IA & Begin Preparation of IA Results*	*Review of IA Results by Program Manager*	*Distribution of Final Briefing by IPAO*	*APMC Decision Review*
Concept Decision Review	-120 days before Decision Review	ICA data – 90 days before Decision Review	-65 days before Decision Review	-60 days before Decision Review	-20 days before Decision Review	-10 days before Decision Review	Day-0
Preliminary NAR	-150 days before Decision Review	ICA data –90 days before Decision Review	-65 days before Decision Review	-60 days before Decision Review	-30 days before Decision Review	-20 days before Decision Review	Day-0
NAR	-150 days before Decision Review	ICA data – 120 days before Decision Review	-65 days before Decision Review	-60 days before Decision Review	-30 days before Decision Review	-20 days before Decision Review	Day-0
Production Review	-120 days before Decision Review	ICA data –90 days before Decision Review	-65 days before Decision Review	-60 days before Decision Review	-20 days before Decision Review	-10 days before Decision Review	Day-0
PIR	-120 days before Decision Review	ICA data –90 days before Decision Review	-65 days before Decision Review	-60 days before Decision Review	-20 days before Decision Review	-10 days before Decision Review	Day-0

Table H-2 Program (Chapter 2)

Project Event	*Initiate IA activities*	*Data Submittal*	*Site Field Review*	*Conclude IA & Begin Preparation of IA Results*	*Review of IA Results by Project Manager*	*Distribution of Final Briefing by IA Organization*	*GPMC Decision Review*
NAR	-150 days before Decision Review	Baseline CADRe -120 days before Decision Review (Category I and II only)	-65 days before Decision Review	-60 days before Decision Review	-30 days before Decision Review	-20 days before Decision Review	Day-0 GPMC Decision Review

Table H-3 Common Project (Chapter 3)

Project Event	*Initiate IA activities*	*Data Submittal*	*Site Field Review*	*Conclude IA & Begin Preparation of IA Results*	*Review of IA Results by Project Manager*	*Distribution of Final Briefing by IA Organization*	*GPMC Decision Review*
Concept Decision Review *	-120 days before Decision Review	ICA data –90 days before Decision Review; no CADRe[47]	-65 days before Decision Review	-60 days before Decision Review	-20 days before Decision Review	-10 days before Decision Review	Day-0 Decision Review GPMC
Preliminary NAR	-150 days before Decision Review	Preliminary CADRe –90 days before Decision Review (Category I and II only)	-65 days before Decision Review	-60 days before Decision Review	-30 days before Decision Review	-20 days before Decision Review	Day-0 Decision Review GPMC
NAR	-150 days before Decision Review	Baseline CADRe -120 days before Decision Review (Category I and II only)	-65 days before Decision Review	-60 days before Decision Review	-30 days before Decision Review	-20 days before Decision Review	Day-0 Decision Review GPMC
Production Review *	-120 days before Decision Review	ICA data –90 days before Decision Review; updated CADRe –90 days	-65 days before Decision Review	-60 days before Decision Review	-20 days before Decision Review	-10 days before Decision Review	Day-0 Decision Review GPMC

Table H-4 Flight Systems and Ground Support Projects (Chapter 6)

* Only for Evolutionary Acquisition.

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47 CADRe Part A (project description) and a preliminary version of CADRe Part B (technical and programmatic description) is required three months prior to the decision review. An update to Part B is required 30 days prior to the decision review. CADRe Part C (the project lifecycle cost estimate) is due immediately after the decision review.

H.2 Project Milestone Reviews (PMR)

PMRs are the life-cycle series of rigorous system-level technical and programmatic evaluations conducted at key formulation and implementation milestones. Key milestones in this context are the major transition points in the life cycle, such as the transition from requirements development to design activities, final design to manufacturing, and the transition from the assembly and integration of components to system-level environmental testing. PMRs may include, but are not limited to, System Concept Review, Requirements Review, Preliminary Design Review, Critical Design Review, Pre-Environmental Review, Test Readiness Review, Pre-Ship Review, and Operational Readiness Review. Managers define the appropriate critical milestone reviews and document them as internally imposed requirements per the Agency Systems Engineering policy. The purpose of a PMR is to assess the technical and programmatic health of a program, project, or major element of a project with respect to the success criteria and acceptable risk. The reviews provide top-down systematic evaluations of the derivation and functional allocation of requirements, the engineering implementation to address the requirements, the validation and verification of the requirements, the preparation for operations and data analysis, and the system management processes that tie it all together. The PMRs must also address the resources (e.g., workforce, budget, schedule) required to complete the formulation and/or implementation of the program or project as well as any associated resource constraints, issues/risks, and reserves. PMRs will assert that the ITA technical requirements have been complied with, and the ITA has approved all variances to those requirements.

To minimize the burden on projects, efforts should be made to align PMRs with Independent Reviews, for example SDR and PDR should align respectively with Pre-NAR, NAR.

Members of review teams are chosen, based on their combined expertise, objectivity, and their ability to make a broad assessment of the implementation of the project that employs numerous engineering and other disciplines. A review team that provides continuity throughout the life cycle of the project is desirable to limit the amount of reeducation that must be done to get new members knowledgeable.

This systematic, integrated assessment relies on a robust set of appropriate lower level system and subsystem PDRs, CDRs and Engineering Peer Reviews, etc. The action items, results and recommendations of these reviews are documented and reported out at the next higher level of review. Inclusion of reviewers that are independent of the project advocacy chain on review teams is essential. Centers are expected to have procedures and guidelines in place to provide guidance specific to the work of the Center.

H.3 Engineering Peer Reviews (EPR)

EPRs are focused, in-depth technical reviews used to provide confirmation and offer options by bringing in experts early and at appropriate points throughout the life cycle. A thoughtfully formulated, comprehensive set of EPRs per the Agency Systems Engineering policy, is a cornerstone of a successful project. The reviews provide a penetrating table top examination of requirements, interfaces, design, analysis, manufacturing, integration, test and operational details, drawings, processes, and data.

EPRs are most frequently applied to subsystem or lower level development activities. They are also well suited for the evaluation of requirements, concepts, designs, and processes associated with combinations of subsystems and crosscutting functional subdivisions such as the end-to-end optical path, command and data pipeline, maneuver planning, or autonomous fault detection/correction system. Project Managers and line management define a set of engineering peer reviews appropriate for each project.

EPRs are most effective when accomplished with a small group of reviewers working intimately with the developers. Reviewers are experts independent of the executing team, including experts from outside of the performing organization. Reviewers are appointed in collaboration with the product lead's line management. The customers are the product leads and the Project Manager. They are also accountable for the definition of review objectives and subsequent communication and closure of issues resulting from the reviews.

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